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ABSTRACT

To determine the factors accounting for children's growth in decoding skill, a study examined school entering characteristics--age, sex, ethnicity, and developmental abilities--and school-influenced skills and characteristics--phonemic awareness, letter-name knowledge, basal text, and place in series--of approximately 100 grade one students. Decoding ability was measured by asking the children to read regular or decodable but nonsense words. Intercorrelation analysis of the variables and student performance on three administrations of the decoding text revealed that age and sex were not significant factors in decoding ability, but that language and auditory readiness skills--as measured by the Metropolitan Readiness Tests--and all school-influenced variables were significant, with phonemic awareness showing the greatest predictive value. Children with strong phonemic awareness, whether at, above, or below grade level in reading ability, generally performed best on the third decoding measure, although 15 students with above-average phonemic awareness did have below-average scores. Those findings indicated that phonemic awareness is a necessary but not sufficient prerequisite for learning decoding skills. Other factors might be the need to read decodable words in text and the ability to reason and form generalizations. (Extensive tables of test results are included.) (MM)

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Decoding Acquisition: A Study of First-Grade Readers

Abstract

This report is one portion of a four-part study into literacy which included decoding, spelling, comprehension and writing. Approximately 100 first-grade students were tested for incoming characteristics and school-influenced abilities as predictors of success on three decoding measures. Ability to manipulate phonemes appeared to give the clearest explanation of decoding ability.

Background Methods

A major difference between good and poor readers that has been identified in the literature is rapid and context-free word identification. One factor which appears to contribute to this difference is decoding skill, or the ability to apply letter-sound correspondence generalizations (Biemiller, 1977-78; Lesgold & Perfetti, 1978; Liberman & Shankweiler, 1979; Pace & Golinkoff, 1976; Perfetti & Lesgold, 1977; Perfetti, 1977; Perfetti & Hogaboam, 1975; Shankweiler & Liberman, 1972).

In the first phase of our study, we were interested in determining the factors which account for children's growth in decoding skill during first grade. We examined two primary areas: the first was incoming characteristics and abilities of the students, and the second was the

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influence of school learning. We predicted that the interplay between factors relative to these areas would explain decoding ability, which we could measure by asking the children to read regular or decodable but "nonsense" words (see Figure 1).

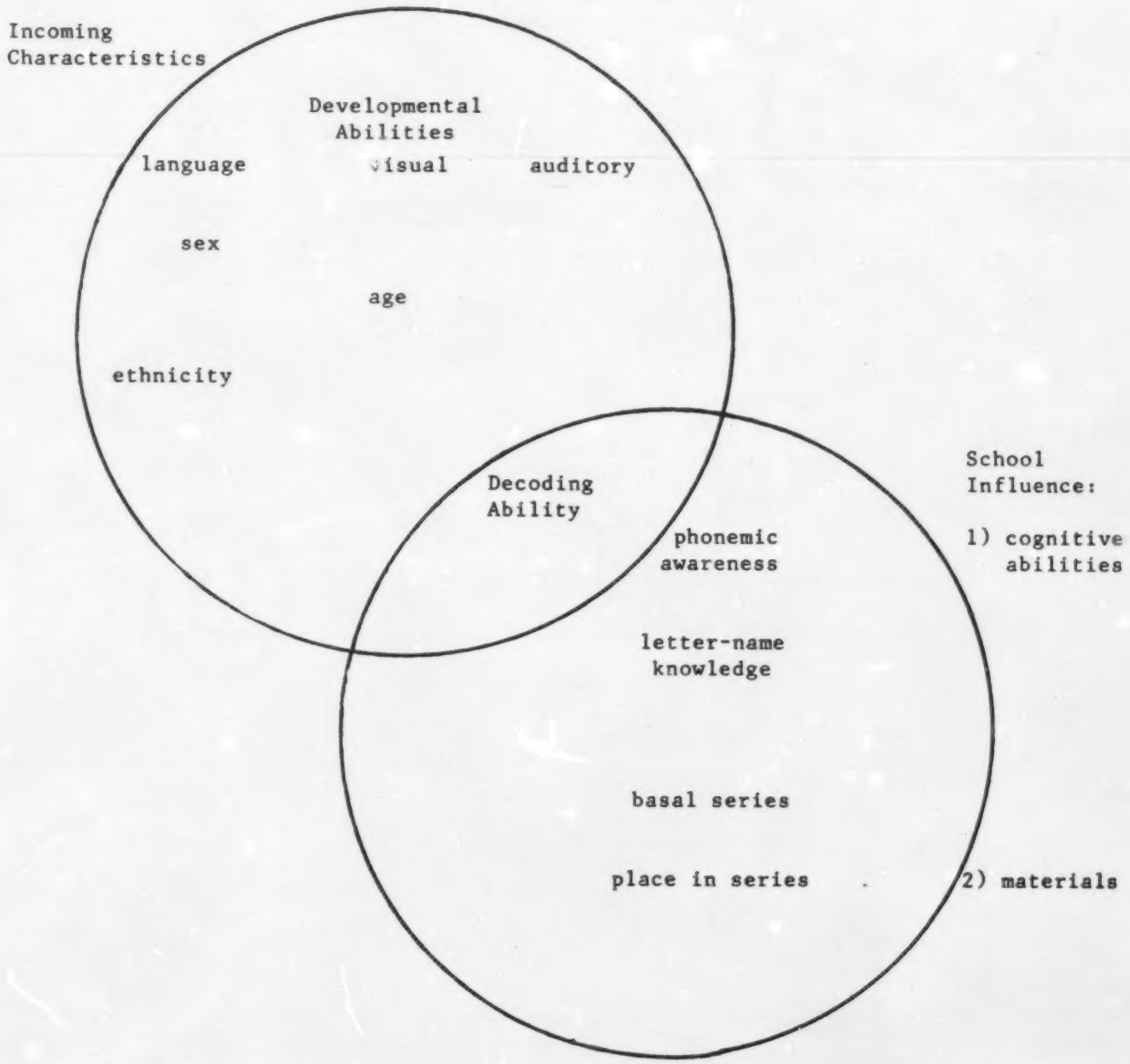
Insert Figure 1 about here

Incoming characteristics in our model included age, sex, and ethnicity, as well as developmental abilities measured by the Metropolitan Readiness Test given in September. The MRT includes three subtests. The language portion is actually a test of listening comprehension, syntax and memory. The visual test involves locating and matching visual patterns. The auditory subtest measures a combination of phonemic awareness, letter-sound correspondence and letter-name knowledge.

We focused on two sub-areas of school-influenced learning to explain decoding performance: some cognitive abilities and the characteristics of the materials used for decoding practice. According to current literature, the ability that seems to be most related to growth in decoding skills is phonemic awareness. This awareness, that words are built from rearrangeable phonemes, is one ability that assists readers in "breaking the code" of an unknown word. Bradley and Bryant's longitudinal study of over 400 beginning readers (Bradley & Bryant, 1983), clearly demonstrated that children with greater phonological

Figure 1

Decoding Ability



awareness become both better readers and spellers than children less phonologically aware. On the basis of this and similar reports in the literature (Bruce, 1964; Gleitman & Rozin, 1977; Liberman, Shankweiler, Liberman, Fowler, & Fischer, 1977; Liberman & Shankweiler, 1979; Lewkowicz, 1980; Bryant & Bradley, 1980), a phonemic awareness was measured in the current study. The test involved segmenting, blending, omitting and substituting individual phonemes. An instrument to measure letter-name knowledge was also included, as that skill has shown to be positively correlated with word identification ability (Durrell, 1958; Samuels, 1980).

The instruction and materials offered children are other factors which affect learning to read (Barr, 1974-75; Chall, 1967; MacKinnon, 1959). Pertinent to this aspect of the study was the basal in which children were instructed and practiced decoding skills. The school in our study provided two basals: a 1980 edition of the American Book Company series, and a 1981 edition of the Scott Foresman series. Though definitely not a "phonics-type" reader, the ABC basal contains fairly predictable letter-sound correspondences and shorter words, such as "cat", "run", and "hop", when contrasted with Scott Foresman, which emphasizes less predictable and longer words, such as "tomorrow", "feathers', and "surprised."

Not only the basal used, but the child's place within the series at the time of testing was important, since it reflected exposure to a volume of print. We therefore established a scale of text completion based on increments of 500 words.

Table 1

Intercorrelations Between Incoming Characteristics and Decoding Measure (L-S)

	L-S 1 (Oct.)	L-S 2 (Feb.)	L-S 3 (May)
Age	-.0719 NS	-.0260 NS	-.0593 NS
Sex	.1043 NS	-.0030 NS	.0747 NS
Ethnicity	-.2149 p =.059	-.2277 p =.011	-.2028 p =.021
MRT (Total)	.2649 p =.026	.4074 p =.001	.4881 p =.001
MRT (Language)	.1119 p =.210	.2179 p =.015	.3545 p =.001
MRT (Auditory)	.4507 p =.001	.5306 p =.001	.5250 p =.001
MRT (Visual)	.0771 NS	.0955 NS	.0968 NS

Design/Analysis

The intercorrelations between the incoming variables and performance on the three administrations of the decoding or letter-sound correspondence measure are shown on Table 1.

Insert Table 1 about here

The decoding measure in our study was the Bryant Diagnostic Test of Decoding Skill which uses nonsense syllables. Age and sex were not significant in the intercorrelation analysis. The total and subtest sections of the Metropolitan Readiness Tests, except for the visual portion, correlated significantly. All incoming abilities which had a significant relation to decoding skills were used in further analyses.

Every one of the school-influenced variables (phonemic awareness, letter-name knowledge, basal, and place in series) correlated significantly with performance on the decoding measure.

Insert Table 2 about here

A series of regression analyses were run using the factors from both the incoming and school-influenced abilities which demonstrated strong correlations with decoding skill. The factors which appeared to be the most predictive (phonemic awareness and place in series) are shown in the

Table 2

Regression Analysis with Decoding Measure

	Decoding (L-S) 1 Oct. N = 53	Decoding (L-S) 2 Feb. N = 99	Decoding (L-S) 3 May N = 99
Total Variance (of full model)	.424 F(3,49) =12.0**	.481 F(3,95) =29.4**	.543 F(3,95) =37.6**
Unique Variance (of each factor)			
Phonemic Awareness (PA)	.104 F(1,49) = 9.5**	.210 F(1,95) =42.0**	.268 F(1,95) =53.6**
Place in Series	.033 F(1,49) = 3.0	.019 F(1,95) = 3.8+	.016 F(1,95) = 3.2
PA x Basal	.002 NS	.010 F(1,95) = 2.0	.005 F(1,95) = 1.0

\+ p = < .06
* p = < .05
** p = < .01

regression analysis on Table 2. Variance in the number of subjects (from 53 to 99) was due to the fact that students were not tested until they had completed the readiness program. In this model, as in other analyzed, the factors which appeared to be significant on the intercorrelation matrices, were dwarfed when phonemic awareness was included. In other words, of all of the highly correlative factors, phonemic awareness stood alone in significantly explaining decoding ability.

Table 2 depicts significance of the total model at the .01 level in all three administrations of the decoding measure. Phonemic awareness was also uniquely significant at the .01 level, and its effect was so powerful it encompassed the unique variance of the other factors. The place in series on the second decoding test approached significance, but again was small when compared to phonemic awareness. A final factor, the interaction of phonemic awareness x basal, was included in this mode not because of its sole contribution here, but to illustrate findings on separate analyses.

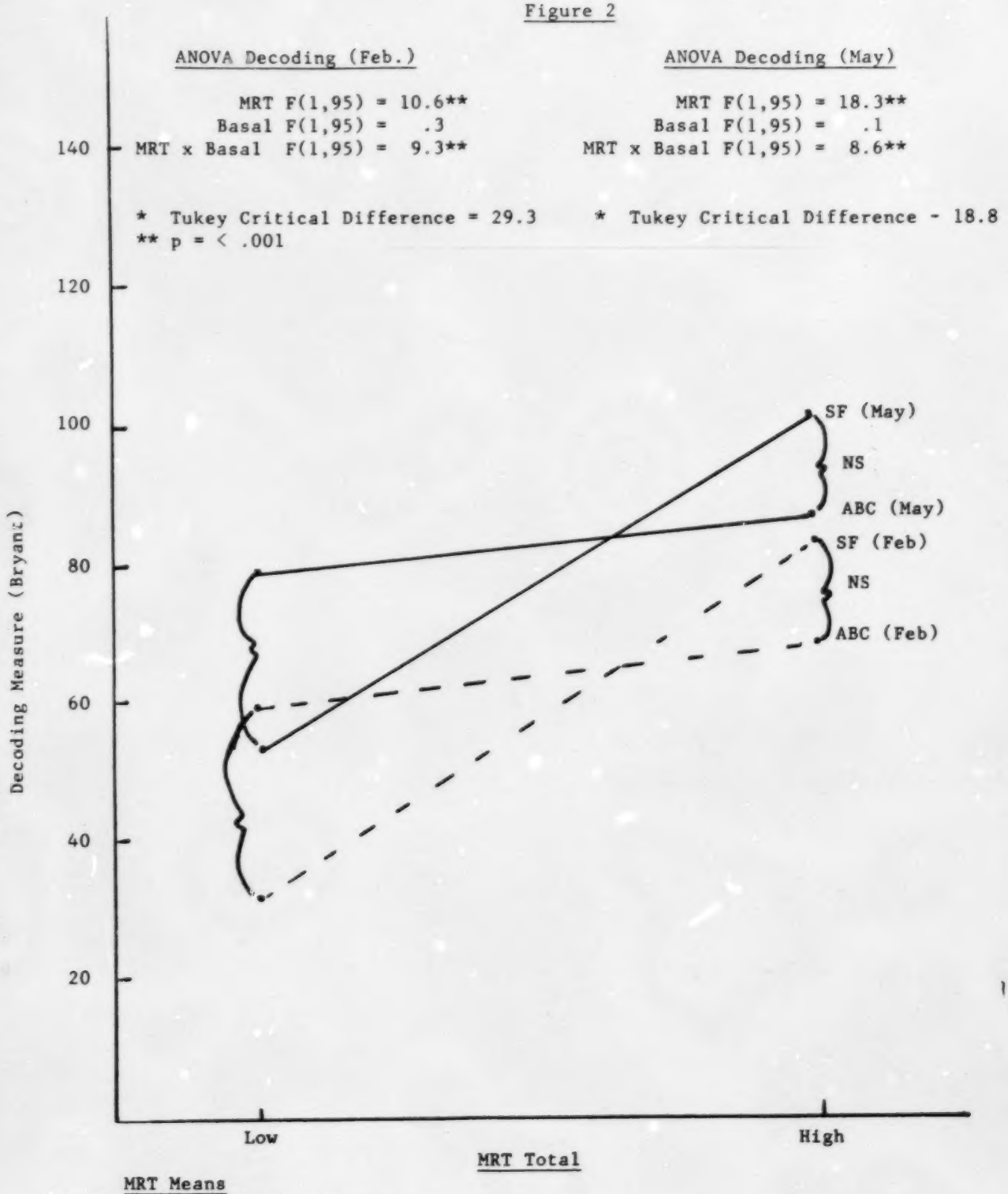
We found there was a significant effect of basal on decoding performance in a two-way analysis of variance using the total score on the Metropolitan Readiness Test and the decoding test as a dependent measure (see Figure 2). Though, in general, incoming abilities were unimportant in comparison to learning that occurred during the school year, MRT was not because of its connection to phonemic awareness, primarily through the auditory subtest.

Insert Figure 2 about here

Figure 2 shows the result of the analyses on the second and third decoding measures, which were taken after the children had been exposed to their respective basals for a significant period. The mean score of low MRT children using ABC was 60 whereas the mean Scott Foresman score was 37 on the February test. Similarly, the low MRT children using ABC scored a mean of 80 on the May decoding test, and the Scott Foresman group averaged only 55. Both differences were statistically significant. Exposure to more regular words, as found in the ABC series apparently helps children with lower incoming abilities learn decoding rules, as the first grade year progresses, if they have developed some phonemic awareness insight. Those children with higher incoming abilities did somewhat better using the Scott Foresman series, though the results were not statistically significant.

Thus, although we did not find the interaction of phonemic awareness x basal to show a significant effect on decoding performance in the regression analysis previously described, the effect of basal appears important in forming letter-sound knowledge for children with lower incoming abilities after some minimal level of phonemic awareness has been reached.

Figure 2



MRT Means

	Lo MRT	Hi MRT
ABC	40.3	63.3
SF	39.4	61.6

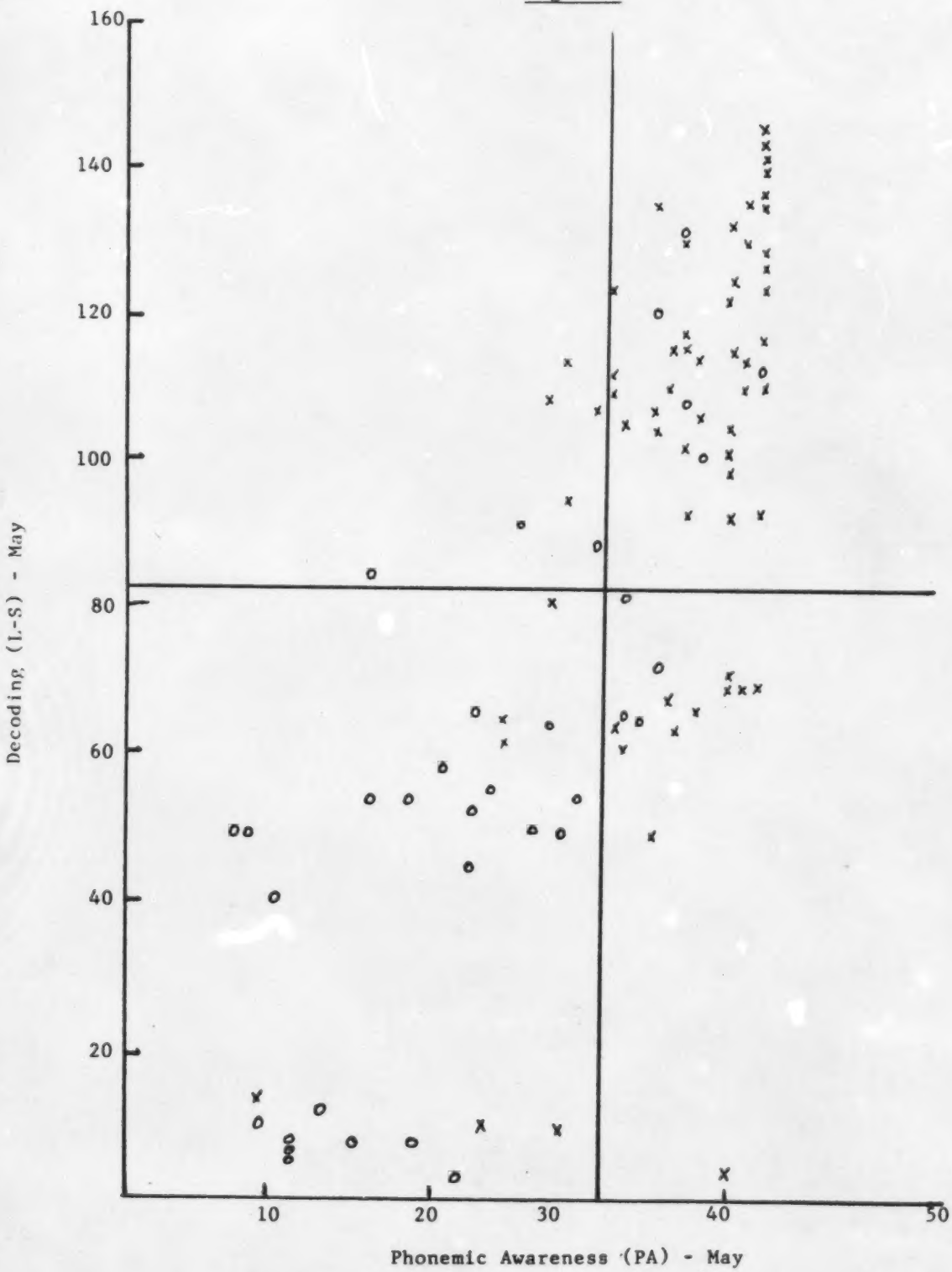
Insert Figure 3 about here

Conclusions

The strength of phonemic awareness ability in predicting decoding performance at the end of the year is graphically demonstrated in a scatterplot represented by Figure 3. Children with strong phonemic awareness, whether at or above grade level in reading ability (as indicated by an "x") or below grade level (as indicated by an "o") performed best on the third decoding measure. Those without that ability consistently demonstrated an average performance on the decoding test, while 15 children with above average phonemic awareness scored below average on the decoding measure. Those findings suggest that phonemic awareness is a necessary but not sufficient prerequisite needed to learn decoding skills. Other factors might be the need to read many regular or decodable words in text, and a cognitive ability to reason and form generalizations.

Insert Table 3 about here

Figure 3


160
140
120
100
80
60
40
20
Decoding (I.-S) - May
10
20
30
40
50
Phonemic Awareness (PA) - May

Successful performance on a decoding measure which assesses a child's ability to read nonsense words, though, is not an end in itself. Table 3 shows the positive correlations between the decoding and phonemic awareness measures and other aspects of literacy that we are studying. The decoding measure correlates highly with both reading comprehension and spelling, and phonemic awareness is also correlative with decoding and writing.

Even more convincing of the influence of decoding and phonemic awareness is seen in the results of a regression analysis which showed that almost 70 per cent of the full variance on the reading total score of the Iowa Test of Basic Skills, could be accounted for by two variables: phonemic awareness and decoding skill.

Insert Table 4 about here

Table 4, like the scatterplot in Figure 3, shows that the unique contribution of decoding ability, phonemic awareness and the interaction between phonemic awareness and decoding were also significant. The results appear to arise from the strong contribution of decoding, and its predictor, phonemic awareness, to reading ability.

Table 3

Intercorrelations between
Decoding Measure (LS) and
Phonemic Awareness (PA) with
Reading Comprehension, Spelling, Writing

	L-S 3 (May)
Reading Comp.	.6812 p = < .001
Spelling	.7262 p = < .001

	PA
L-S 3	.7250 p = < .001
Writing	.4293 p = < .001

Table 4

Regression Analysis with Iowa Reading Total

	May Administration	N = 99
Total Variance (of full model)	.669	F(3,95) = 64.0**
Unique Variance (of each factor)		
Decoding (L-S) 3	.019	F(1,95) = 6.3*
Phonemic Awareness (PA)	.022	F(1.95) = 7.3**
PA x Decoding	.047	F(1,95) = 15.6**

* p = < .05
** p = < .01

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